

# Engineering Mathematics

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## **Abstract**

During the Spring of 2022 I learned a vast ray of material from PhD. William Edward Hahn in Engineering Mathematics. I learned many topics from Artificial Intelligence, the language of Python, Matrix Multiplication, and how they related to Differential Equations. I also learned how to use certain applications such as Google collaborate, Github, Overleaf, and Alexnet. Using these applications and different topics and seeing how they intertwine with Differential Equations was revolutionary in how this course was taught to set up the new era of the future.

## **1 Course Topics**

In Engineering Mathematics, some of the subjects I learned was what Artificial Intelligence (AI) is and how it can be used in real world problems. For example, I did an Alexnet project that was able to detect the difference between metal baseball bats and wooden baseball bats. An Alexnet is a Convolutional Neural Network type of architecture designed by scientific researchers. To further specify, an Alexnet is a system where it processes images, where the images are inputted into the code and it computes to identify what the image

is with an accuracy/error percentage. These types of systems can be used for many other fields to detect other types of things. Another example would go even further in Artificial Intelligence being a cause solution in help finding out school shootings or find certain villages in the world that are at risk for attacks on innocent people and families. AI can use millions of images for its systems in differentiating the factors of these situations. These Artificial Intelligence machines can work longer and could be smarter in the future than a human which could possibly be a factor in saving lives in a certain situation. Another major idea I learned in Engineering Mathematics was the Convolution of Neural Networks. With the use of Artificial Intelligence rapidly growing and the goal for these Artificial Intelligence machines to do the job of a human, we as people are getting closer to that goal everyday. That is where Convolution Neural Networks comes into play. Convolution Neural Networks is a Deep Learning Algorithm where the Artificial Intelligence takes an input image, it differentiates how important it is to other objects and images. This algorithm does this to differentiate the objects and images to one another. That is what I did for the Alexnet class project, because the algorithm was able to differentiate what was a metal baseball bat and a wooden baseball bat.

## **2 Tools and Resources**

The tools and resources I used helped me immensely with the topics and projects I worked on throughout the semester. I learned what the language of Python was and how to use it during my projects. Dr. William Edward Hahn explained how Python was the most important language to learn, and I could not agree more because

of all the problems one can solve with learning how to use Python is extremely useful. I also did projects where I learned how to use Google Collaborate. Learning how to use collaborate was amazing because I was able to translate code and put it in my projects. I also used Overleaf to type my reports, which I am doing right now because I feel it ties into the technology we used this semester. Another great tool I used this semester was Github. Dr. Hahn explained that if you meet a random person and they ask you do you have a resume or business card to show me, I could just direct them to my Github which shows all the projects I have done and my profile because it is like my personal website.

### **3 Applications In The Real Word**

Some of the Applications I did was how I was able to use Artificial Intelligence and use it on my certain projects to see how they were able to figure out a task when I gave the project data to work with. Another project I did was when I was researching a video and experiment between Man and a Machine. The goal of the experiment was to see who the better Table Tennis player was. After many hours of research and experimentation, the purpose was to see how good the machine was at table tennis and it how quickly it could learn through different challenges the human component would through at it. As time went on the smarter the machine got with seeing different scenarios of table tennis ball variations. For example, in Table Tennis there is different spins you can hit a ball at your opponent with. With different type of spins you would hit the ball at the machine it took more time for the machine to react and learn to this data. However, with time and more training the machine was able to learn

with its Artificial Intelligence. After research and me observing this experiment, I believe in the long run, the machine would beat man because of the time factor. It would take a lot longer for a machine to get tired than a human and that is one of the reason why I believe the machines would have the advantage. For me to learn that all this is possible with Artificial Intelligence is astounding, because if a machine can do this, the possibilities are endless. To further go into my Alexnet project, I had to have 50 images of metal baseball bats and wooden baseball bats each. I saved the images on my Google drive and connected my drive to the Alexnet code. The code went through 30 Epoch trials to find how accurate the system was to identify what type of image it was. I ended up having a 80 to 90 percent accuracy. After that I made a test to see if the code can figure out which image I gave to test it. The result was a success in accuracy and it found out it was a wooden baseball bat.

## 4 Conclusions

In conclusion, Engineering Mathematics with PhD. William Edward Hahn was an amazing class full immersive material and projects that helped me learn a lot more conceptual ideas and topics that I thought I was going to learn at the beginning of the semester. I learned arguably that most profitable language in Python, that I can put on my resume and possibly do more personal projects that can help me get advance my career and make more income in the future. I learned the vastly growing field of Artificial Intelligence and how it could used to possibly solve real world problems. I learned about the convolutional neural networks and how it relates to Artificial Intelligence. Another great thing was how to keep all my work in a

safe, organized, and professional location like Github. All the knowledge and resources, I feel helped prepare me to learn the material on my own because that is what being in a course like this and a University should be, having the information and learning it on my own time so I can become an expert at the material. I thank Dr. Hahn for opening this way of learning and thinking in Engineering Mathematics.